Powerful Processors – Easy to Use™

SKP38024 StarterKit Plus

User's Manual

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www.renesas.com

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1.0 Introduction

The SKP38024 StarterKit Plus (SKP) is a low-cost development environment for evaluating Renesas software development tools and the H8/38024 group, which is part of the H8/300L High Speed series of microcontrollers. Micro controller units (MCU) of the H8/38024 group are equipped with a LCD (Liquid Crystal Display) controller/driver.

The kit comes with a complete software development tool chain for Renesas MCUs, including High-performance Embedded Workshop (HEW), which includes Integrated Development Environment (IDE), Graphical User Interface (GUI) and Software Debugger; H8S-H8/300 C-compiler, assembler and linker; and the E8 In-Circuit Debugger (ICD).

A real-time, source-level debug environment is implemented using the HEW4 software debug interface in conjunction with the E8 ICD hardware. The E8 also allows for programming H8/300 devices within HEW.

The E8 and firmware provide a convenient USB (Universal Serial Bus) interface between the SKP38024 board and the host PC. This interface reduces resource requirements on the H8/38024 MCU, allows faster code downloads, and can be used with many other Renesas Flash MCUs, SKPs, and user target boards.

2.0 Contents of Product Package

This section describes the contents of the SKP38024 product package. When unpacking your SKP38024, please check to see that all items listed below are included.

2.1. SKP38024 QuickStart Kit Item List

Table 2-1 lists the items included in the SKP38024.

Table 2-1 SKP38024 Item List

Item Name	Quantity	Remarks
SKP38024 Board	1	H8/38024 SKP Board
E8 Debugger	1	HEW Debugger / USB Programmer Interface Device (includes 14-pin ribbon cable)
6' Mini USB Cable	1	Connects E8 Debugger to Host PC
SKP CD-ROM	1	Auto-install program HEW (IDE & debugger) H8S, H8/300 C-compiler, assembler, and linker USB drivers Manuals Tutorials Sample programs
SKP38024 Quick Start Guide	1	Assists user in installing the tools and launching them for the first time.
Promotional CD	1	Evaluation versions of third-party tools may be included with the kit

2.1.1. CD-ROM

The CD-ROM contains the electronic manuals and software necessary for developing programs. Your computer must have a web browser — like Mozilla Firefox, Netscape® Browser or Microsoft® Internet Explorer — to view the help files, and Adobe® Acrobat® Reader® to view the manuals.

Insert the enclosed CD into your computer; the installer should auto-start. The installer program will create `C:\Renesas` and `C:\Workspace` folders on your machine. Documentation, sample code, and other SKP-related files are in the `C:\Renesas` folder. HEW is installed in the `C:\Program Files\Renesas` folder by default.

If the installer program does not start automatically, browse to the CD's root folder and double-click on `SKP-Installer.exe` to start the installation.

3.0 Limited Guarantee and Support

Renesas Technology America, Inc., warrants the SKP38024 to be free from component or assembly defects for a period of 180 days from the date of purchase. Settlement is limited to repair or replacement of the product only. Renesas Technology America, Inc., does not assume any liability arising out of the application or use of any product, circuit or procedure described herein. No other liability or warranty applies, expressed or implied. Software warranty is limited to replacement of the CD only. While every attempt has been made to ensure accurate documentation, Renesas Technology America, Inc., cannot be held responsible for errors or omissions, and reserves the right to make changes without prior notice.

4.0 System Connectivity

The following hardware and software products are required to use the SKP38024 QuickStart Kit.

- Host Computer (supplied by user)
- SKP38024 Board
- E8 Debugger
- Target Cable
- Mini USB cable
- Software Tools (HEW IDE, Compiler/Linker) installed on host computer

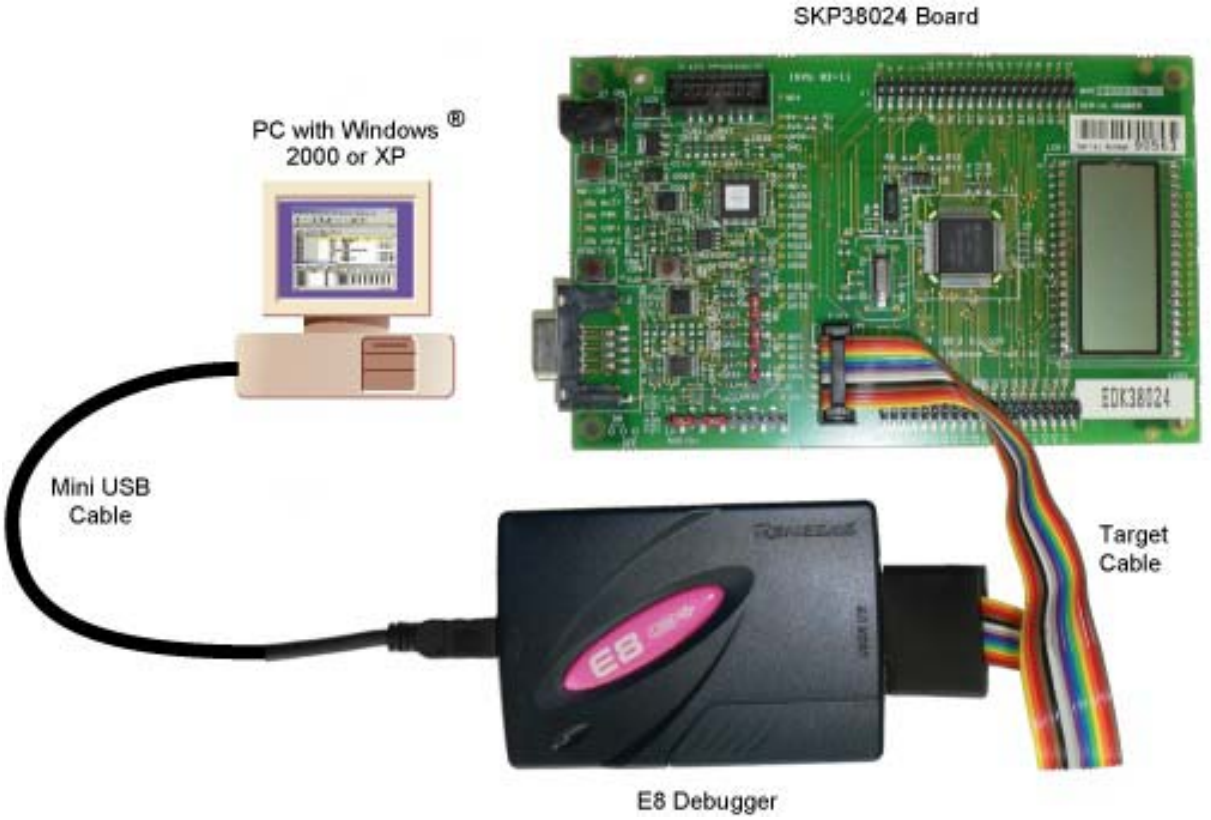


Figure 4-1: SKP38024 System Connectivity

4.1. Host Computer Requirements

The minimum requirement to be able to use the software that comes with the SKP38024 is a PC with a USB port and Microsoft Windows 98, Me, 2000, or XP.

4.2. SKP38024 Board

The SKP38024 board provides an evaluation and development environment for the H8/38024 group of MCUs. See section “5.0 Hardware” for more details.

4.3. E8 Debugger

The E8 provides a plug-and-play debugging and programming interface to the H8/38024 Evaluation Board via the host computer's Universal Serial Bus (USB). The USB port also provides power to the H8/38024 board and E8 thereby eliminating the need for an external power supply. The E8 can be used also to debug code on a user's target board; see the "E8 Emulator…Notes for H8/38024" available from the Start menu (Start > (All) Programs > Renesas > SKP38024 > All Manuals and Documents).

4.4. Software Development Tools

The installer program installs all the development tools. For details on installation, see the QuickStart Guide or instructions in Appendix A of this manual. A brief description of all the included tools follows. Please refer to the individual tool manuals for detailed information.

4.4.1. HEW (High-performance Embedded Workshop)

HEW provides a Graphical User Interface (GUI) that integrates the software development tools and includes the C-compiler, assembler, linker, debugger and editor.

4.4.2. H8S, H8/300 Evaluation Version C Compiler

The evaluation version of the H8S, H8/300 C-compiler is provided with the same functionality as the commercial version except that link size will be restricted to 64 kBytes after 60 days from when you begin using the compiler. Contact your local sales representative if you wish to purchase a full license.

4.4.3. HEW Debug Interface

HEW communicates with a kernel (i.e. a ROM monitor program) on the target MCU through the E8 Debugger. This debug interface provides a highly efficient evaluation environment. Features include:

- Source-level debugging for assembly and C language
- Source editing in debug window
- Single-step command
- 2 hardware breakpoints* (events): 1 address and 1 data breakpoint.
- Up to 255 software breakpoints
- C variable "watch" window

**Note: The number of breakpoints will vary depending on the Flash MCU used.*

4.4.4. Renesas AutoUpdater

Included with HEW 4.0 and later is the Renesas AutoUpdater utility. This utility can be configured to search our website (or your server) automatically for updates of the Renesas tools installed on your PC.

4.4.5. Documentation, Sample Projects and Project Generators

The SKP includes a full set of user documentation, sample projects, and project generators (a project generator is a template to create a project for a specific target). After installing the CD, the sample projects can be found in the `C:\Renesas\SKP38024\sample_code` folder. Documentation can be browsed by using the "Manual Navigator" from the Start menu (Start > (All) Programs > Renesas > SKP38024 > All Manuals and Documents).

5.0 Hardware

5.1. SKP38024 Board

Figure 5-1 shows the SKP38024 Board with major components identified.

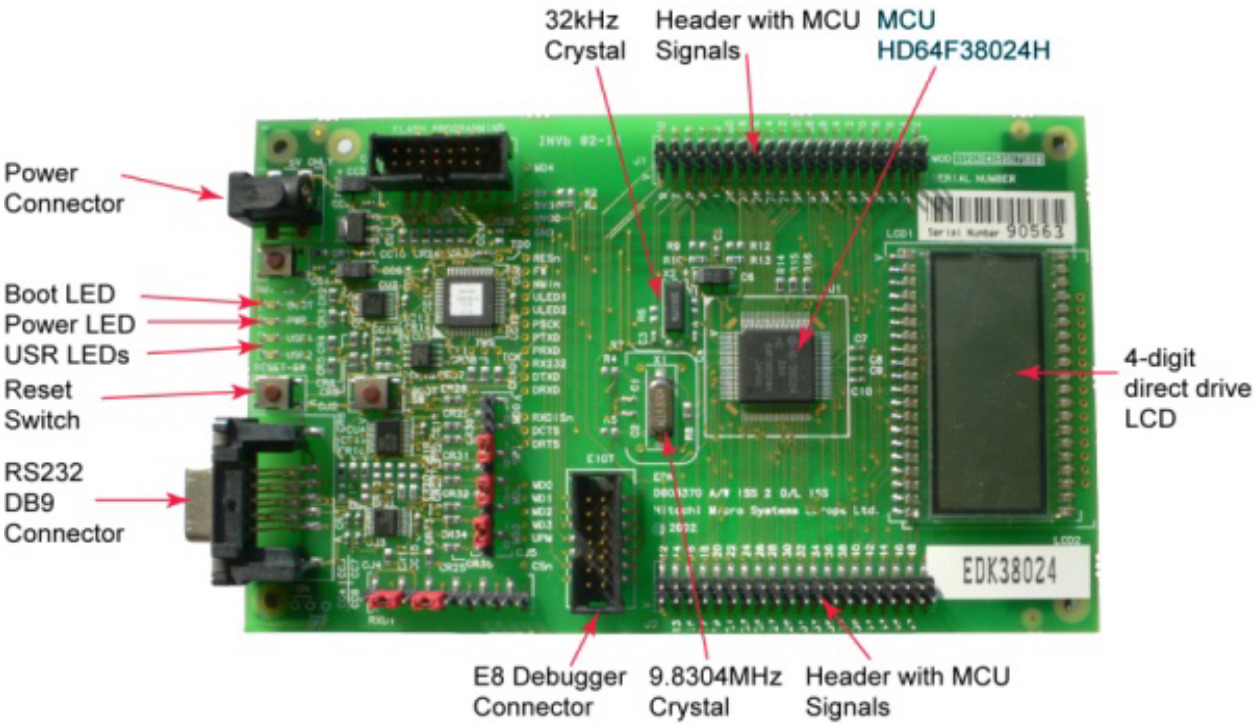


Figure 5-1: SKP38024 Board

5.2. SKP38024 Board Block Diagram

The SKP38024 board incorporates an HD64F38024 (H8/38024) in an 80-pin QFP package from the H8/38024 group of microcontrollers, designated as U1.

Figure 5-2 shows the SKP38024 block diagram.

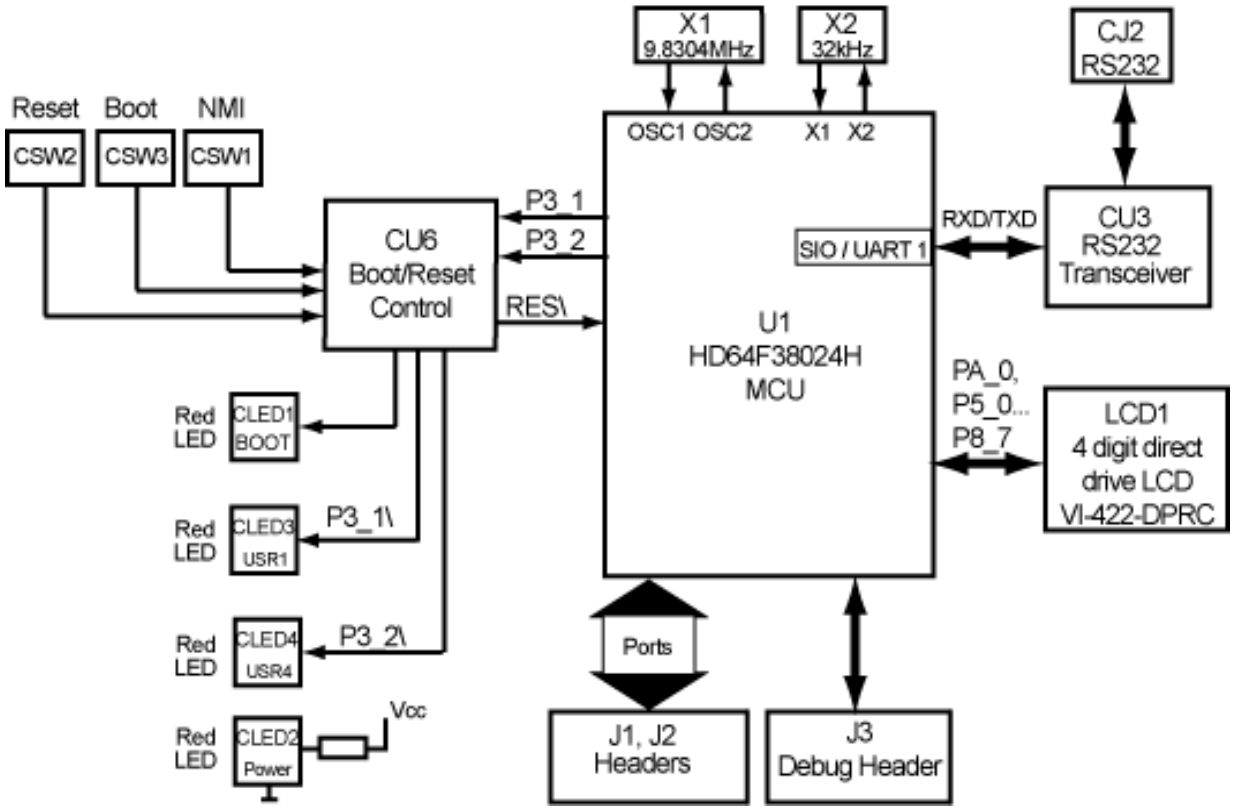


Figure 5-2: SKP38024 Block Diagram

5.3. H8/38024 Group of MCUs

The H8/38024 group of 16-bit single-chip Flash microcontrollers (MCU) is part of the H8/300L High Speed Family. The hardware and software manuals for the H8/38024 group of microcontrollers can be found in the `C:\Renesas\SKP38024\Docs` folder on your PC or from the Start menu (Start > (All) Programs > Renesas > SKP38024 > All Manuals and Documents) after SKP software installation.

5.4. SKP38024 Functional Blocks

The SKP38024 board's main components include an H8/38024 single-chip microcontroller, a Boot/Reset controller, RS232 serial port, and a four-digit direct-drive LCD.

5.4.1. Boot/Reset Controller

The Boot/Reset controller IC CU6 contains the decoding necessary to place the SKP38024 board into Boot mode and to reset the MCU with a timed pulse. CU6 also acts as input for the three pushbuttons: Reset, Boot and NMI. It controls the status of the Boot LED and inverts the pin signals P3_1 and P3_2 coming from the MCU to control the User LEDs USR1 and USR2.

5.4.2. Switches

The SKP38024 provides three pushbuttons to control the operation of the board. Each button is marked clearly on the PCB's silkscreen.

Reset Switch
Pressing this button (CSW2) applies a timed reset pulse of at least 250ms to the microcontroller.

Boot Switch
Pressing the Boot Switch (CSW3) triggers the Boot/Reset Controller to generate the necessary signaling to switch the microcontroller into Boot Mode. In Boot Mode, the MCU's Flash memory can be programmed via the serial port with the Flash Development Toolkit (FDT) software (not included with this kit).

When using the included E8 Debugger to program the Flash, no user intervention is required to put the MCU into Boot Mode.

NMI Switch
The NMI switch, CSW1, has no function on this board; the H8/38024 MCU does not have an NMI pin.

5.4.3. LEDs

The SKP38024 has four red LEDs. The function of each LED is marked clearly on the silkscreen of the PCB. Please refer to the board layout diagram in Appendix D for position information.

When the board is connected to a power source, the Power (PWR) LED will illuminate. The Boot Mode indication LED will illuminate when the microcontroller has been placed into Boot Mode by pressing the Boot Mode switch.

Two LEDs dedicated for user control are marked USR1 and USR2. Each LED will illuminate when the port pin is in a logical **high** state.

The user LEDs are controlled by the following pins:

Table 5-1: LED Pin Connections

LED	MCU Pin	QFP80 Package Pin
USR1	P3_1/MOFL	62
USR2	P3_2/MOFH	63

5.4.4. RS232 Serial Interface

The serial RS232 transceiver CU3 is connected to the MCU's on-chip UART. It is used to program the board's on-chip Flash memory via a PC's serial port using the FDT software (not included with

this kit). Your own code may utilize the RS232 interface to communicate with a PC or other terminal hardware. Optional configuration settings on the board allow you to implement handshake signaling using standard port pins.

By default, CTS and RTS are **not** connected to any MCU pins. If you want to use hardware handshaking, you have to place 0Ω resistors in positions CR19 and CR22, and your code has to process the CTS and RTS signals in software. See the schematics for details.

The SKP38024 RS232 interface conforms to Data Communication Equipment (DCE) format allowing the use of 1-1 cables when connected to Data Terminal Equipment (DTE) such as a PC. The cable used to connect to the SKP38024 will affect the available board options. A fully wired cable can allow handshaking between the microcontroller and the host PC, subject to setting the board options and the availability of suitable host software. Handshaking is not supported as standard on the microcontroller, so normally a minimal three-wire cable can be used. The minimum connections are shaded in the following table.

Table 5-2: RS232 Interface Connections

DB9 Connector Pin	SKP38024 Signal	Host (PC) Signal
1	No connection	No connection
2	Tx	Rx
3	Rx	Tx
4	No connection	No connection
5	Ground	Ground
6	No connection	No connection
7	CTS	RTS
8	RTS	CTS
9	No connection	No connection

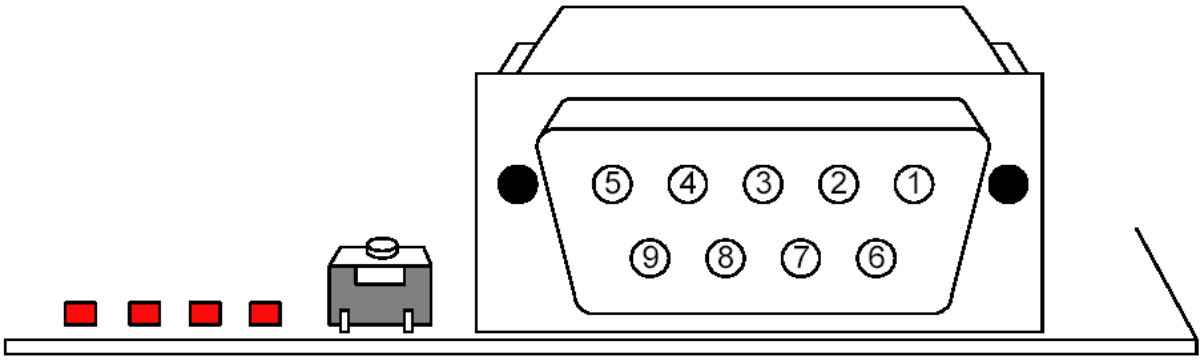


Figure 5-3: DB9 Connector Pinout

5.4.5. LCD

The supplied LCD is a Varitronix VI-422-DPRC (direct-drive 4 digits). The two ‘common’ pins and the ‘colon’ symbol of the VI-422 LCD are connected to COM1 of the LCD controller.

An alternative LCD footprint is available on the SKP38024 board for a VIM-503-DP-RC-LV LCD (3-way multiplexed 4.5 digit).

To allow the use of 4-way multiplexed LCDs that require four common pins, COM4 from the H8/38024F is routed to pin 16 on the VIM-503 footprint, which is a 'no connect' for this LCD.

The following are sample LCD controller register settings:

Table 5-3: LCD Register Settings

Register	Action	Comment
LPCR	OR with 08h (VI-422) OR with 88h (VIM-503)	Static duty cycles (COM1 used); all ports are LCD segment I/Os. 1/3 duty cycle (COM1-3 used); all ports are LCD segment I/Os (could use spares as port pins if configured accordingly).
LCR	OR with FCh	Turn on LCD supply, cont/driver & display RAM data; clock = sys/32.
LCR2	AND with 00h	Use waveform A.
CKSTPR2	OR with 01h	Clear LCD module standby mode in module stop register.

5.4.6. SKP38024 I/O Ports

All of the H8/38024 MCU's pins are accessible via expansion headers J1 and J2. See Appendix C Expansion Headers for details.

If you reconfigure the SKP38024 I/O ports, pull-up resistors may be required for proper operation in some configurations.

When you connect external analog signals to the SKP38024, make sure that you also connect the MCU's analog voltage supply and reference pins to the appropriate voltage levels. AGND and AVcc are by default connected to digital Vcc and GND via removable 0Ω resistors, R10 and R13. By removing R10 and R13 and installing 0Ω resistors in locations R9 and R12, you can apply an analog supply voltage different from the digital supply via the expansion header.

5.5. Flash Programming Connector

The Flash Programming Header (CJ3) is for use with legacy programming tools. Do **not** connect your E8 debugger to this connector.

5.6. E10T Debug Connector

Connector J3, labeled E10T on the PCB's silkscreen, is for connecting the E8 In-Circuit Debugger/Programmer that is included with your Starter Kit. See Figure 4-1: SKP38024 System Connectivity.

5.7. SKP38024 Board Jumper Configuration

The SKP38024 has a number of configuration settings set by jumpers CJ4 (A, B, C, D) CJ5 (A, B, C, D) and 0Ω links. Common SKP38024 functions can be set using the jumpers as described in sections 5.7.1 and 5.7.2.

Zero-ohm links provide additional features that may be required to interface with other systems.

All the Jumper link settings are three-pin options. There are four sets of options on each header.

The headers are numbered from 1 to 12 with pin 1 marked on the PCB by an arrow.

The diagram below shows the numbering of these jumper links and indicates jumpers fitted in position 1-2 for each three-pin jumper.

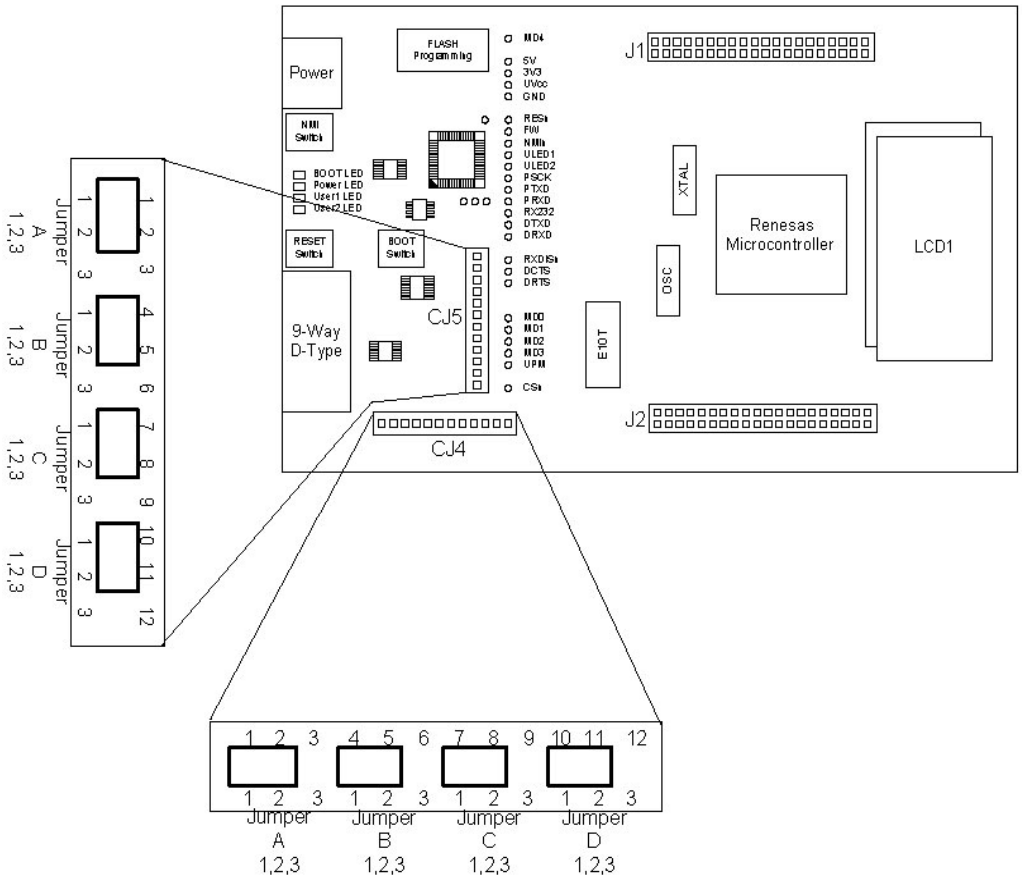


Figure 5-4: Jumper Configuration

5.7.1. CJ5: User Mode Settings

CJ5 has no function on this board; the H8/38024 device has no mode pins.

5.7.2. CJ4: RS232 Receive Enable

Only jumper CJ4-A is used on this board. CJ4-B, -C and -D are reserved.

CJ4-A Jumper position	Function	Comment
1-2	RS232 Receive disable	Disables the RS232 receive signal to enable the use of the Flash Programming Header.

CJ4-A Jumper position	Function	Comment
2-3 (default)	RS232 Receive enable	Enables the RS232 receive signal. The Flash Programming Header must not be used in this state.

6.0 System Operation & Limitations

The SKP38024 provides sophisticated on-board debugging features at a low cost. The SKP38024 does have some limitations when used with the HEW software and E8 Debugger. Section 6.1 introduces the kernel (ROM monitor) program and its purpose. The limitations when this kernel is running with the user program are listed in Table 6-1. For details on debugging H8/38024 MCUs, see the "E8 User's Manual" and "H8/38024 specifics for the E8 Debugger" available from the Start menu (Start > (All) Programs > Renesas > SKP38024 > All Manuals and Documents).

Table 6-1: System Limitations when Debugging

Item	Please Refer To
User Limitations	6.2 Pin and Peripheral Limitations
	6.3 Memory Map
	6.4 Low-Power Modes
	6.5 Limitations on Interrupts
Debugger Limitations	6.6 Sleep Instruction Limitations The kernel cannot be run in STOP or WAIT modes. Do not use these modes when debugging your program.
	6.7 User Program's Real-Time Capability

6.1. Kernel (ROM Monitor) Introduction

During debug, a small program called a kernel is uploaded to the H8/38024 MCU. The kernel communicates with HEW through the E8 Debugger regarding MCU status during user code debugging operations.

There are no special steps required in the user program to make use of the E8 (you only need to select the "Download emulator firmware" option when HEW attempts to connect to the MCU). The operation of the kernel is transparent to the user, but there are some limitations. These are discussed from section 6.2 onward.

After starting a HEW debug session, the E8 uploads the kernel to the H8/38024 if it does not already exist (e.g. on a blank device). After downloading the kernel, the H8/38024 is ready to download user code.

Connecting the E8 Debugger without starting HEW will not affect the signal lines connected between the E8 and the H8/38024; the E8 keeps the signal lines in a high-impedance state. The E8 Debugger only drives the pins after HEW FDT* attempts to connect.

After completing program debug and verification with HEW, you can create an image of your code in Intel (.hex) or Motorola (.mot) file formats. This image can be programmed into the H8/38024 by disconnecting the E8 then reconnecting using the "Flash memory writing" option. This procedure erases the kernel and leaves only the user program.

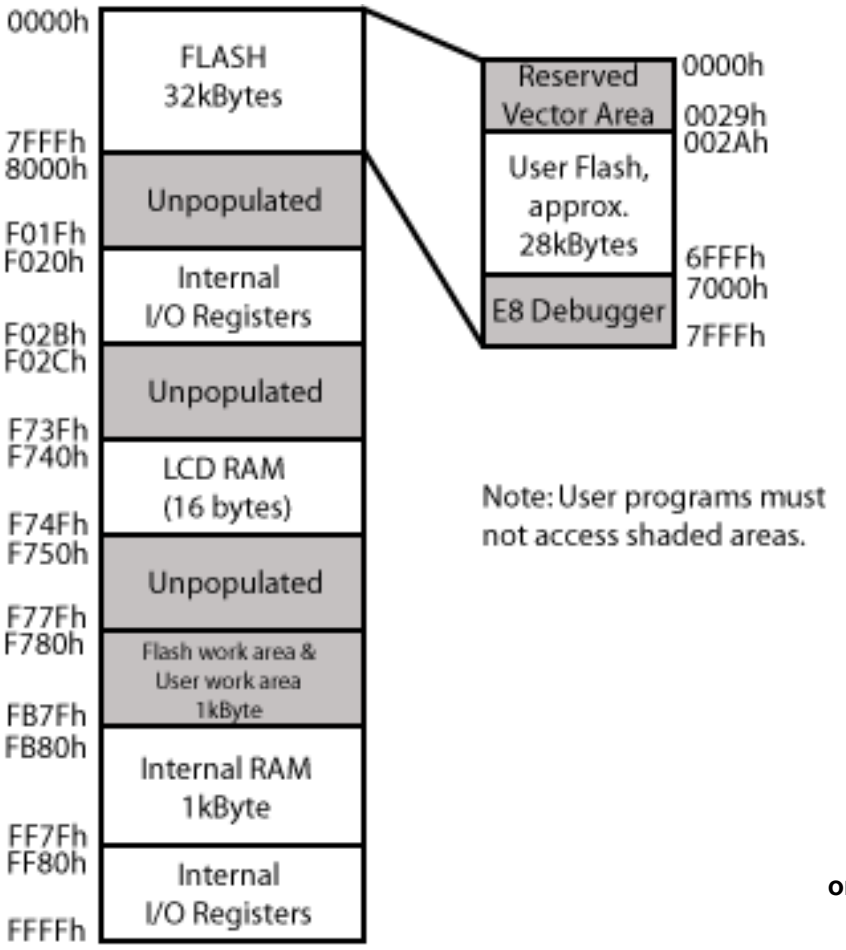
6.2. Pin and Peripheral Limitations

Although the MCU can use the on-chip oscillator while debugging, a clock signal must be connected to the OSC1 pins when the E8 Debugger is connected (i.e., do **not** remove X1). Pins $P3_3$ to $P3_5$ and $P9_5$ are dedicated to debugging. Do not connect these pins to any other circuit. For details, see the "H8/38024 specifics for the E8 Debugger" available from the Start menu (Start > (All) Programs > Renesas > SKP38024 > All Manuals and Documents)".

* FDT is a Renesas MCU Flash erase/write program not supplied with this kit.

6.3. Memory Map

The amount and locations of memory used by the kernel on the SKP38024 board's H8/38024MCU are shown in Figure 6-1.



ory Map with

Note: E8 uses a two-word stack pointer for values stored on a user program break. Therefore, the stack area needs to be 4 bytes larger than what the user program requires.

6.4. Low-Power Modes

During a user program break, the CPU operating frequency is forced to the system clock (φ) for high-speed operation. It is recommended that for accurate low-power evaluation, you download your application code without the debug kernel (use the "Flash memory writing" option) and evaluate it without the debugger (requires optional 5 Volt DC power supply).

6.5. Limitations on Interrupts

During full-featured debugging, the E8 Debugger uses the $\overline{\text{NMI}}$ interrupt and therefore this interrupt vector is unavailable. Any attempts to write to the $\overline{\text{NMI}}$ interrupt vector are ignored, and if you select 'Debug > Verify Memory…' HEW will report a verify error.

6.6. Sleep Instruction Limitations

When the interrupt mask bit (I) in the condition code register (CCR) is 1, do not perform step execution of the SLEEP instruction. If step execution of the SLEEP instruction is performed and not finished correctly, disconnect and restart the E8.

6.7. User Program's Real-Time Capability

While the kernel is in a "STOP" state, the hardware peripherals will continue to run. Therefore, interrupts may not be serviced properly. In addition, the watchdog timer will not be serviced and likely will time out if active.

While the kernel is in a "RUN" state, there is no overhead on the application code **unless** you initiate the "Refresh" command in the "Memory" window.

6.8. Watchdog Timer

When the E8 Debugger is activated, the watchdog timer is disabled. The user program should not enable the watchdog function.

7.0 SKP38024 Board Specifications

7.1. Hardware Specifications

Table 7-1 lists the specifications of the SKP38024 Board.

Table 7-1: SKP38024 Board Specifications

Item	Specification
MCU	HD64F38024
Clocks	Main Clock: crystal 9.8304 MHz or on-chip oscillator Sub Clock: 32.768 kHz crystal
Memory	RAM: 1kB Flash ROM: 32kB
Connectors	[CJ1]: Power Supply Connector (optional) 5V DC [CJ2]: 9-pin Sub-D RS232 connector [CJ3]: 14-pin connector for Flash Programming [J3]: 14-pin connector for E8 Debugger [J1,J2]: 20-pin dual-row headers for user target connection
Jumpers	[CJ4-A]: RS232 Rx enable/disable [CJ4-B,C,D]: no function [CJ5]: no function
Switches	[CSW1]: NMI Switch (no function as H8/38024 has no NMI pin) [CSW2]: Reset Switch [CSW3]: Boot Switch
LEDs	[CLED1] (Red): Boot Mode Activated [CLED2] (Red): Power LED [CLED3] (Red): User1 [CLED4] (Red): User2
LCD	[LCD1]: Varitronix VI-422-DPRC, 4 digits, direct drive

7.2. Power Supply Requirements

The SKP38024 board can be powered with an optional 5V DC power supply, whose input voltage is converted by the board's voltage regulator down to 3.3V to supply the rest of the board.

Power to the board also can be supplied by the E8 Debugger, which itself is powered via the USB bus. In this case, no external power supply is required. The E8 Debugger's output voltage is user selectable to either 5V DC or 3.3V DC. **With the SKP38024 board in its default configuration, a voltage of 3.3V must be used.** Using the E8 Debugger to power the board is recommended only as long as you do **not** connect any additional circuitry to the board.

The H8/38024 MCU operates over a wide voltage supply range, from 2.7V to 5.5V. The board can be reconfigured to run in a mixed-voltage mode that allows the MCU and some components to run at 5V DC while some other board components continue to run at 3.3V DC. Supply the MCU with 5V if you intend to replace crystal X1 to run at a faster clock speed than the default 9.8304 MHz. Clock speeds above 10 MHz require a supply voltage >4.5V. To configure the board for mixed voltage mode, remove 0Ω resistor R3 and place a 0Ω resistor in position R2. Note: with that configuration, the output voltage of the power supply connected to the board's power connector is applied directly to the MCU. Therefore, it is important that this voltage comes from a regulated and stable 5V DC source. See the schematics for more detail.

7.3. Operating Environment

Table 7-2 lists the environmental conditions for using and storing the SKP38024 board. Store the board in a conductive bag inside the original factory packaging.

Table 7-2: Operating and Storage Environments

Environmental Condition	Ambient Temperature	Ambient Humidity
Operating	0 to 55°C (No corrosive gas allowed)	30 to 80% (non-condensing)
Storage	-30 to 75°C (No corrosive gas allowed)	30 to 80% (non-condensing)

Appendix A. Troubleshooting Guide

This section discusses possible problems you may encounter while installing the development tool software, USB drivers, or running the HEW debugger. This section also discusses the countermeasures and solutions to resolve these problems.

If, for any reason, you cannot resolve the problem, please contact your Renesas representative for assistance.

A.1 USB Driver Problems

This part discusses how to fix common problems that may occur with USB driver installation. The most common problem is that Windows did not properly install the USB drivers, so the E8 Debugger is not recognized. In this case, Windows Device Manager may indicate that the 'Renesas Emulator' device is not working properly.

Before trying the following steps, try restarting your PC to see if this resolves the problem. You can check the USB Driver status using the Windows Device Manager (Start > Control Panel > System Properties > Hardware > Device Manager > Universal Serial Bus controllers). Expand the 'Renesas Emulator' entry, and if the 'Renesas E-Series USB Driver' appears with **no** red X or yellow exclamation point, the driver was installed properly.

NOTE: You will need Administrator privileges to be able to install the drivers.

For cases where "Renesas E-Series USB Driver" appears with a red X or yellow exclamation point in the Windows Device Manager, please try the following:

1. Open the Windows Device Manager (Start > Control Panel > System Properties > Hardware > Device Manager > Universal Serial Bus controllers).
2. Click on 'Renesas Emulator' and double-click on 'Renesas E-Series USB Driver'; a properties dialog box appears.
3. Click on the [Driver] tab and click the <**Update Driver**> button.
4. Select 'Display a list…' and click on the <**Have Disk**> button.
5. Browse to the `C:\Windows\systems32\Drivers` directory and install the `E1usb.sys` driver.

A.2 Debugging Problems

This section discusses the causes of common problems, and countermeasures to resolve them. The common problems encountered with debugging are:

- Erratic debug behavior
- Can't connect to target
- Issues that may come up during debug operations
- Can't debug in HEW

A.2.1 Erratic Debug Behavior

When using hardware breakpoints, program execution stops **after** executing the (assembler) instruction on which the breakpoint is set. As a result, C watch variables may not update as expected. If the break occurs on a branch instruction, program execution may stop far from the location where the actual breakpoint is set. If this behavior causes you problems, we recommend that you use software breakpoints. Software breakpoints break **before** executing the instruction on which the breakpoint is set.

HEW allows you to launch multiple instances of itself. However, if more than one instance of HEW is open during a debug session, erratic behavior can result. Running the FDT Programmer software at the same time as HEW can result in erratic debug behavior also.

A.2.2 Can't Connect to Target

If the message "Can't connect with the target" or "Boot failed" is displayed when attempting to connect, there are several reasons that may have caused the message to appear. Each cause and its corresponding countermeasure is discussed below.

- The SKP38024 board is not connected correctly.

Check the connection between the E8 Debugger, the PC, and the SKP38024 board. Please see section "4.0 System Connectivity".

- The E8 Debugger has no power (ACT LED of E8 is off).

Ensure that the Mode switch under the cover on the E8 is in the "1" position.

The E8's power is supplied via the USB bus. Check that your USB cable is not broken. Check that your PC's USB port is working correctly. If you connect the E8 via a USB hub, check the connectivity between the hub and your PC. If you use a self-powered hub, check the power supply of your hub.

- The selected MCU kernel image loaded in the E8 Debugger and the actual target MCU (H8/38024) do not match.

Close the error message by clicking on the <**OK**> button, then click on the <**Cancel**> button of the Init window. Re-connect to the E8 (you may need to disconnect first). Make sure you select 'H8/38024F'. If the MCU kernel image loaded on the E8 is different, HEW will re-program the E8 Debugger to match it.

- The target MCU is damaged.

Try a different target board and see if HEW will connect. You may have a damaged board or MCU.

- System Seems to lock up at "Connecting".

Occasionally, HEW cannot proceed past the "Connecting" window. This typically is due to a bad connection to the target, or selecting the wrong target MCU. HEW will time out eventually, but if you do not wish to wait, hit Ctrl-Alt-Del keys and cancel HEW.

A.2.3 Issues that May Arise During Debug Operations

While debugging user code, some issues may come up because the limitations discussed in section "6.0

System Operation & Limitations" were not satisfied. The common issues are listed in Table A.2, including the countermeasures.

Table A.2

Problem	Possible Cause(s) and Solution
After stepping a few instructions, HEW cannot "stop" or locks up	• MCU stack has over-run, or restricted memory areas were accessed. Check your code.
HEW locks up (cannot stop program) or Communication error message is displayed	• Ensure no limitations, as discussed in Section 6, were violated. • Do a hardware reset. User-program runaway may be corrupting the kernel (RAM, interrupt vectors, flags, etc.). Close debug session, check your code, then restart. • User program enables watchdog timer. Close debug session, remove watchdog code in source files, recompile, and restart the debug session..
Download problems	• HEW project was not set up properly (startup files missing or out of order, files added to wrong member, etc.). Try creating a new project and adding your source files to it. For details, please see the HEW User's Manual.

Note: Please see the E8 user's manual for troubleshooting potential problems with the E8 Debugger.

Appendix B. Reference Manuals

Item	Title	Description
1.	**SKP38024 QuickStart Guide**	Document that will help you get started on using the SKP38024 Starter Kit
2.	**SKP38024 User's Manual**	This document
3.	**SKP38024 Circuit Schematic**	Schematic diagram for SKP board
4.	**H8/300L Software Manual**	Instruction set for the H8/300L series CPU cores
5.	**H8/38024 Hardware Manual**	Operation and Specifications for the H8/38024 MCU
6.	**E8 User's Manual**	E8 Debugger Manual
7.	**H8/38024 specifics for the E8 Debugger**	E8 Debugger information specific to the H8/38024
8.	**HEW 4.0 User's Manual**	Document that describes installation and operation of this Integrated Development Environment for Renesas' Tools

NOTE:
The installer will copy all these manuals during installation. They can be viewed using the Document Descriptions file by clicking on Start > (All) Programs > Renesas > SKP38024 > All Manuals and Documents.

Appendix C. Expansion Headers

The HD64F38024 MCU on the SKP38024 target board is housed in an 80-pin QFP package. The location of Pin 1 is identified by a white arrow on the PCB's silkscreen.

Connectors J1 and J2 provide access to all of the MCU's pins. Commonly available 2.54mm (0.100 inch) pitch male double-row headers with 0.635mm (0.025 inch) square posts are used.

You can use J1 and J2 as test points to check MCU signals or to connect your own expansion board. The silkscreen identifying the connectors is at the top of the SKP38024 board. The PCB's silkscreen for the J1 and J2 connectors shows the corresponding pin number of the MCU.

The following table shows the mapping of J1 and J2 pins to MCU pins and signal names using sequential numbering for the headers. Pin 1 is indicated by an arrow on the silkscreen.

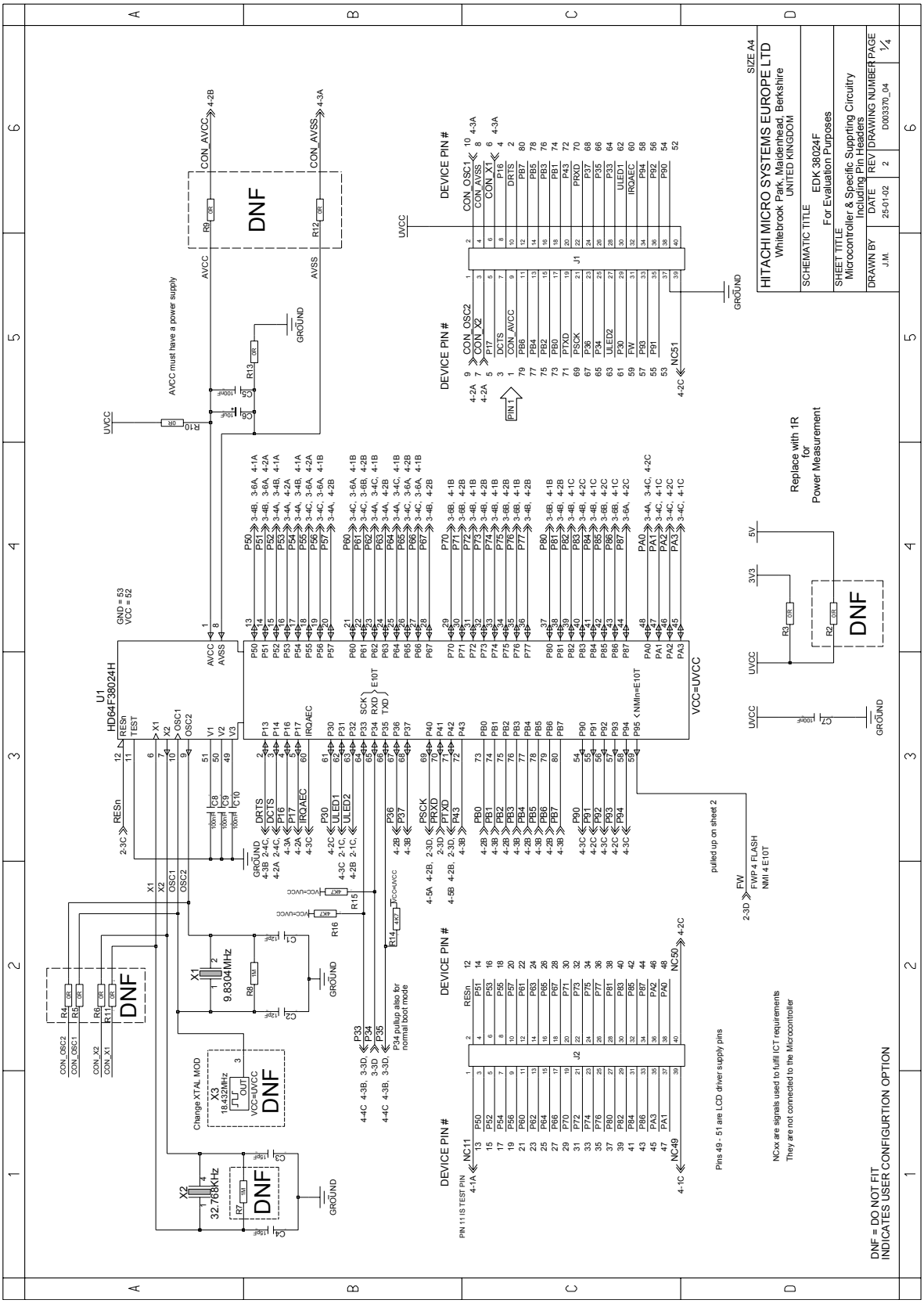
J1 Pin	80 QFP MCU Pin	MCU Function	Board Function		J1 Pin	80 QFP MCU Pin	MCU Function	Board Function
1	9	OSC_1*	CON_OSC2		2	10	OSC_1*	CON_OSC1
3	7	X_2*	CON_X2		4	8	AV_{ss}*	CON_AVSS
5	5	$P1_7$			6	6	X_1*	CON_X1
7	3	$P1_4$	DCTS		8	4	$P1_6$	
9	1	AV_{cc}*	CON_AVCC		10	2	$P1_3$	DRTS
11	79	PB_6			12	80	PB_7	
13	77	PB_4			14	78	PB_5	
15	75	PB_2			16	76	PB_3	
17	73	PB_0			18	74	PB_1	
19	71	$P4_2$	TxD		20	72	$P4_3$	
21	69	$P4_0$	SCK		22	70	$P4_1$	RxD
23	67	$P3_6$			24	68	$P3_7$	
25	65	$P3_4$			26	66	$P3_5$	
27	63	$P3_2$	ULED2		28	64	$P3_3$	
29	61	$P3_0$			30	62	$P3_1$	ULED1
31	59	$P9_5$	NMI from E10T Debug connector		32	60	IRQAEC	
33	57	$P9_3$			34	58	$P9_4$	
35	55	$P9_1$			36	56	$P9_2$	
37	53	GND			38	54	$P9_0$	
39	NC	No connect			40	52	Vcc	

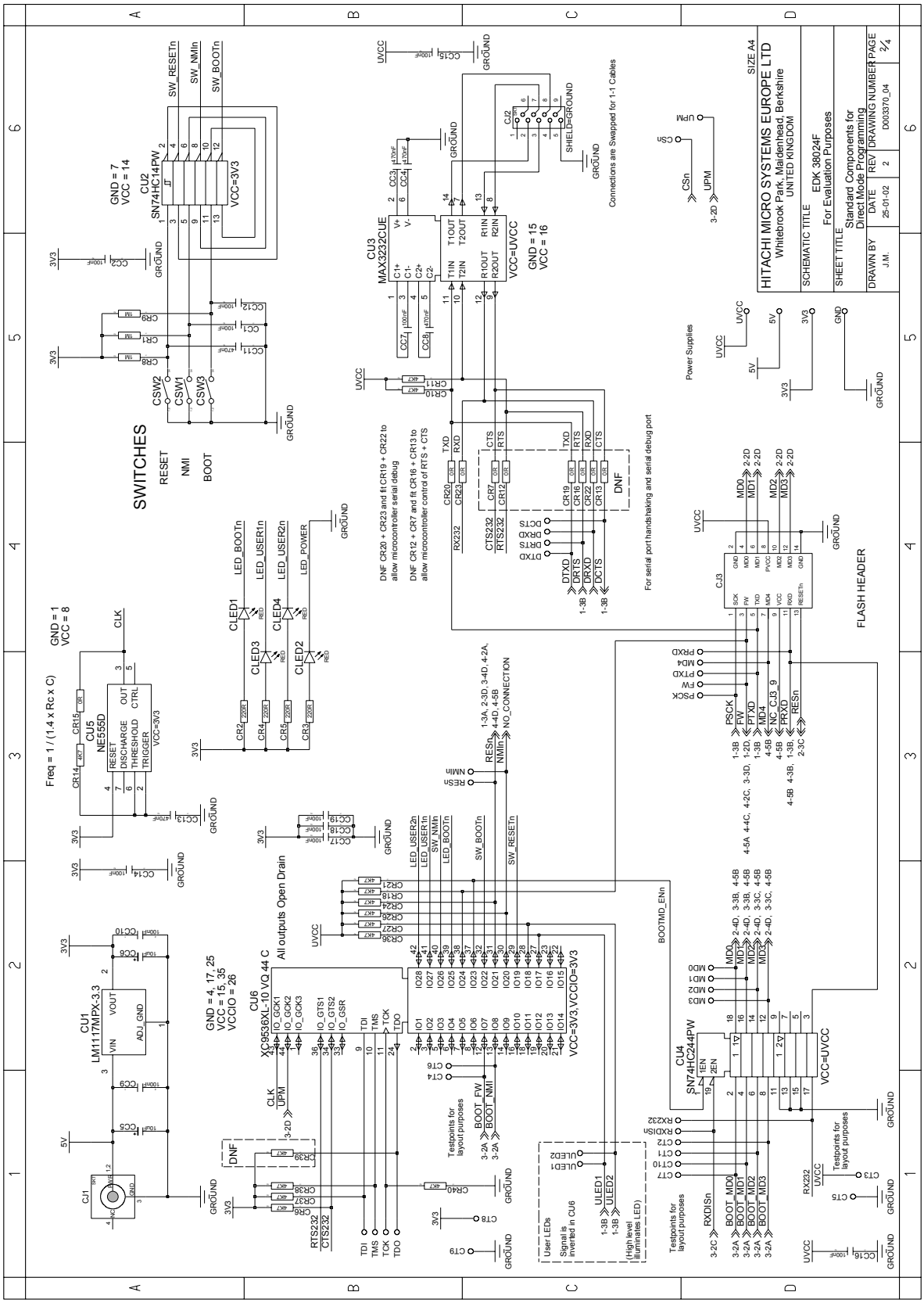
* For these signals there is no direct connection from the header to the MCU pin. Use of these signals requires the placement of a 0Ω resistor on the PCB and the removal of certain components on the board. See the schematics for details.

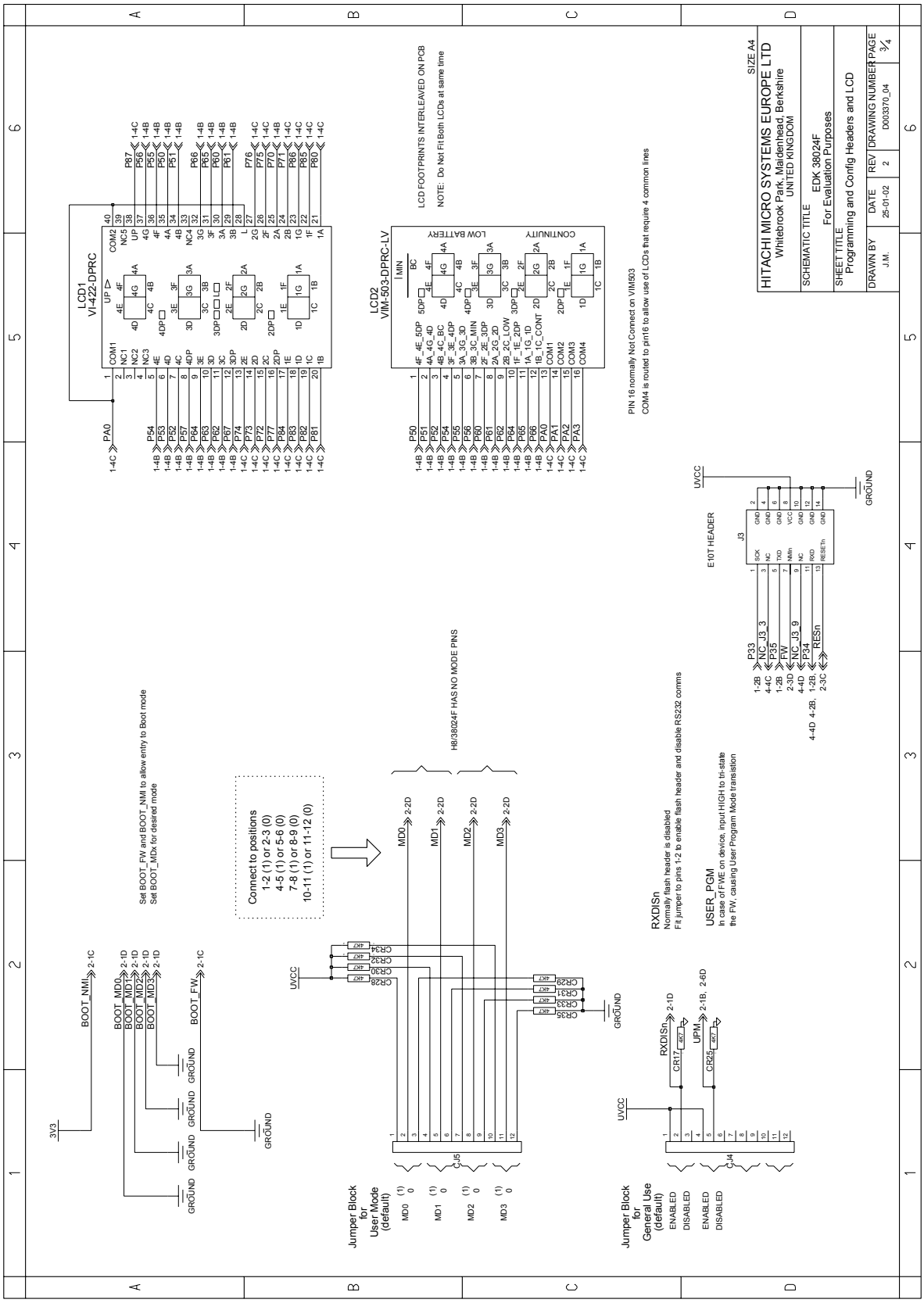
J2 Pin	80 QFP MCU Pin	MCU Function	J2 Pin	80 QFP MCU Pin	MCU Function
1	NC	No connect	2	12	$\overline{RES}$
3	13	$P5_0/SEG_1$	4	14	$P5_1/SEG_2$
5	15	$P5_2/SEG_3$	6	16	$P5_3/SEG_4$
7	17	$P5_4/SEG_5$	8	18	$P5_5/SEG_6$
9	19	$P5_6/SEG_7$	10	20	$P5_7/SEG_8$
11	21	$P6_0/SEG_9$	12	22	$P6_1/SEG_{10}$
13	23	$P6_2/SEG_{11}$	14	24	$P6_3/SEG_{12}$
15	25	$P6_4/SEG_{13}$	16	26	$P6_5/SEG_{14}$
17	27	$P6_6/SEG_{15}$	18	28	$P6_7/SEG_{16}$
19	29	$P7_0/SEG_{17}$	20	30	$P7_1/SEG_{18}$
21	31	$P7_2/SEG_{19}$	22	32	$P7_3/SEG_{20}$
23	33	$P7_4/SEG_{21}$	24	34	$P7_5/SEG_{22}$
25	35	$P7_6/SEG_{23}$	26	36	$P7_7/SEG_{24}$
27	37	$P8_0/SEG_{25}$	28	38	$P8_1/SEG_{26}$
29	39	$P8_2/SEG_{27}$	30	40	$P8_3/SEG_{28}$
31	41	$P8_4/SEG_{29}$	32	42	$P8_5/SEG_{30}$
33	43	$P8_6/SEG_{31}$	34	44	$P8_7/SEG_{32}$
35	45	PA_3/COM_4	36	46	PA_2/COM_3
37	47	PA_1/COM_2	38	48	PA_0/COM_1
39	NC	No connect	40	NC	No connect

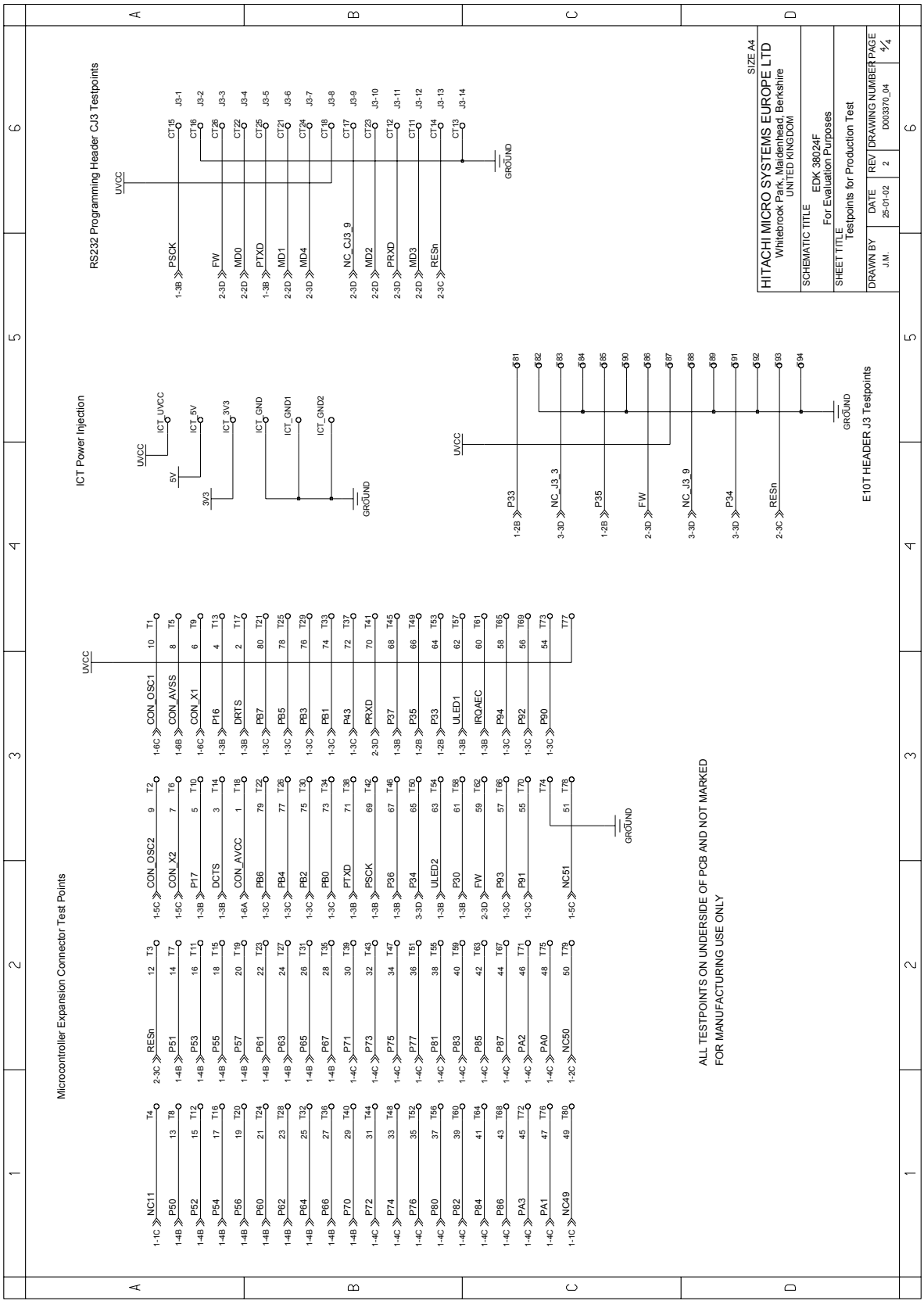
Appendix D. Board Schematic

The circuit board schematics are available as a separate PDF document. It can be viewed via Start > (All) Programs > Renesas > SKP38024 > All Manuals and Documents, or by browsing to the folder `C:\Renesas\SKP38024\Docs` and opening the file:
`sch_SKP38024.pdf`

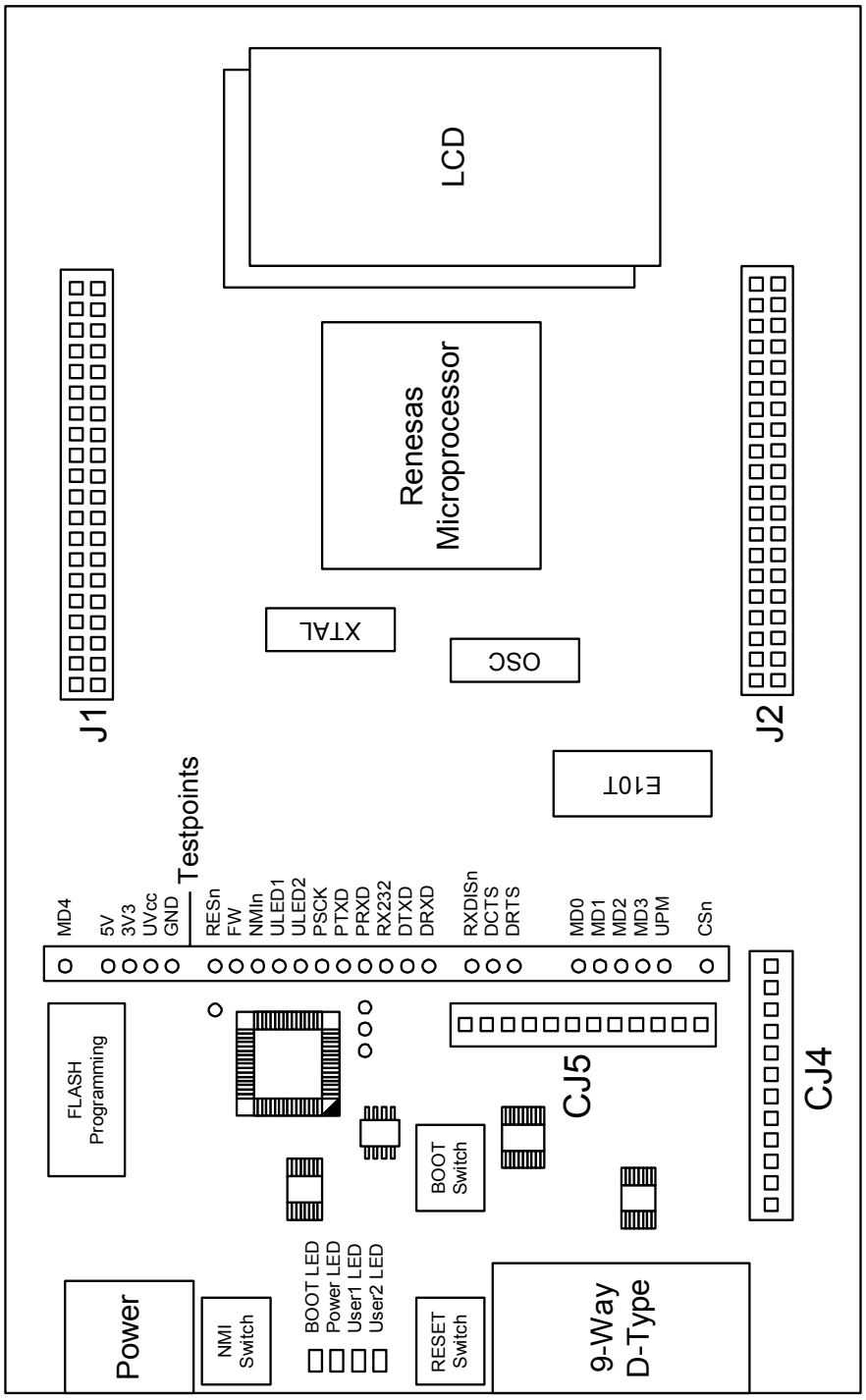

HITACHI MICRO SYSTEMS EUROPE LTD
Whitebrook Park, Maidenhead, Berkshire
UNITED KINGDOM
SCHEMATIC TITLE
EDK 38024F
For Evaluation Purposes
SHEET TITLE
Microcontroller & Specific Supprting Circuitry
Including Pin Headers
DRAWN BY
J.M.
DATE
25-01-02
REV
2
DRAWING NUMBER
D003370_04
PAGE
1/4
SIZE A4
U1
HD64F38024H
DEVICE PIN #
J1
J2
DNF
DNF = DO NOT FIT
INDICATES USER CONFIGURTION OPTION
NCxx are signals used to fulfil ICT requirements
They are not connected to the Microcontroller
Pins 49 - 51 are LCD driver supply pins
pulled up on sheet 2
Replace with 1R
for
Power Measurement
AVCC must have a power supply
Change XTAL MOD
P34 pullup also for
normal boot mode
FWP4 FLASH
NMI 4 E10T
VCC=UVCC
GND = 53
VCC = 52


SWITCHES
RESET
NMI
BOOT
SW_RESETn
SW_NMIn
SW_BOOTn
CU2
SN74HC14PW
GND = 7
VCC = 14
VCC=3V3
CU3
MAX3232CUE
VCC=UVCC
GND = 15
VCC = 16
Connections are Swapped for 1-1 Cables
SHIELD=GROUND
Power Supplies
FLASH HEADER
For serial port handshaking and serial debug port
DNF CR20 + CR23 and fit CR19 + CR22 to allow microcontroller serial debug
DNF CR12 + CR7 and fit CR16 + CR13 to allow microcontroller control of RTS + CTS
CU5
NE555D
Freq = 1 / (1.4 x Rc x C)
GND = 1
VCC = 8
CU1
LM1117MPX-3.3
CU6
XC9536XL-10 VQ 44 C
All outputs Open Drain
GND = 4, 17, 25
VCC = 15, 35
VCCIO = 26
VCC=3V3,VCCIO=3V3
CU4
SN74HC244PW
VCC=UVCC
BOOTMD_ENn
Testpoints for layout purposes
User LEDs
Signal is inverted in CU6
(High level illuminates LED)
SIZE A4
HITACHI MICRO SYSTEMS EUROPE LTD
Whitebrook Park, Maidenhead, Berkshire
UNITED KINGDOM
SCHEMATIC TITLE
EDK 38024F
For Evaluation Purposes
SHEET TITLE
Standard Components for Direct Mode Programming
DRAWN BY
J.M.
DATE
25-01-02
REV
2
DRAWING NUMBER
D003370_04
PAGE
4/4


LCD1
VI-422-DPRC
LCD2
VIM-503-DPRC-LV
LCD FOOTPRINTS INTERLEAVED ON PCB
NOTE: Do Not Fit Both LCDs at same time
PIN 16 normally Not Connect on VIM503
COM4 is routed to pin16 to allow use of LCDs that require 4 common lines
SIZE A4
HITACHI MICRO SYSTEMS EUROPE LTD
Whitebrook Park, Maidenhead, Berkshire
UNITED KINGDOM
SCHEMATIC TITLE EDK 38024F
For Evaluation Purposes
SHEET TITLE
Programming and Config Headers and LCD
DRAWN BY J.M.
DATE 25-01-02
REV 2
DRAWING NUMBER D003370_04
PAGE 3/4
Set BOOT_FW and BOOT_NMI to allow entry to Boot mode
Set BOOT_MDx for desired mode
Connect to positions
1-2 (1) or 2-3 (0)
4-5 (1) or 5-6 (0)
7-8 (1) or 8-9 (0)
10-11 (1) or 11-12 (0)
H8/38024F HAS NO MODE PINS
RXDISn
Normally flash header is disabled
Fit jumper to pins 1-2 to enable flash header and disable RS232 comms
USER_PGM
In case of FWE on device, input HIGH to tri-state the FW, causing User Program Mode transistion
E10T HEADER
Jumper Block for User Mode (default)
Jumper Block for General Use (default)
ENABLED
DISABLED
3V3
GROUND
UVCC


Microcontroller Expansion Connector Test Points
ICT Power Injection
RS232 Programming Header CJ3 Testpoints
E10T HEADER J3 Testpoints
ALL TESTPOINTS ON UNDERSIDE OF PCB AND NOT MARKED
FOR MANUFACTURING USE ONLY
UVCC
5V
3V3
GROUND
ICT_UVCC
ICT_5V
ICT_3V3
ICT_GND
ICT_GND1
ICT_GND2
PSCK
FW
MD0
PTXD
MD1
MD4
NC_CJ3_9
MD2
PRXD
MD3
RESn
NC_J3_3
NC_J3_9
P33
P34
P35
HITACHI MICRO SYSTEMS EUROPE LTD
Whitebrook Park, Maidenhead, Berkshire
UNITED KINGDOM
SIZE A4
SCHEMATIC TITLE
EDK 38024F
For Evaluation Purposes
SHEET TITLE
Testpoints for Production Test
DRAWN BY
J.M.
DATE
25-01-02
REV
2
DRAWING NUMBER
D003370_04
PAGE
4/4

Appendix E. SKP38024 Printed Circuit Board



Appendix F. Other Resources

1. For updates and other evaluation tools, and sample programs for the SKP38024 Kit, see: http://www.renesas.com/skp
2. Renesas microcontroller application notes and sample programs can be viewed at Renesas Technology America's website: http://www.renesas.com